the former satellite the partial effect of perturbation, and leaving the remainder of the process in as simple a form as practicable. He remarks that if the satellites cannot be followed up to December 15, there is little chance of their being seen in 1881, except, perhaps, under greatly improved atmospheric conditions, and we may then have to wait for further observations until the very favourable opposition of 1892; a similar opinion has been expressed by Prof. Newcomb; hence the greater necessity for reliable measures of the satellites during the present opposition. We have not yet heard of any observation of *Phobos* in this country, but Mr. Common continues measures of the position of *Deimos*, which is not far from that given by Hall's elements.

THE MINOR PLANET, PANDORA.—Dr. Axel-Möller, of Lund, has communicated to the Academy at Stockholm an exhaustive determination of the orbit of this small planet, which he appears to have taken under his special charge. It is founded upon the observations at the sixteen oppositions between 1858 and 1877, the perturbations of Mars, Jupiter, and Saturn being rigorously determined by Encke's method. The residual errors are smaller than in any like case we remember, except in Mr. Godward's investigation of the elements of Ceres in 1878, from a similar length of observation (fifteen oppositions) and refined calculation of the perturbations. Dr. Axel-Möller had presented an elaborate memoir on the absolute perturbations of *Pandora* to the Swedish Academy in 1877.

PALISA'S COMET.—Herr Zelbr, of Vienna, has published elements of this comet, which will be probably nearer the truth than any others that have appeared; they are founded on four days' observations between August 21 and September 12, and are as follow:—

Perihelion passage, 1879, October 4·60015 M.T. at Berlin.

	°	′	″	
Longitude of perihelion	202	27	15	Mean Equinox, 1879·0.
,, ascending node ...	87	7	30	
Inclination	77	6	12	
Log. perihelion distance	9·995932			

Motion—direct.

These elements give for Berlin midnight:—

	R.A. h.	m.	s.	Decl. °	′
Oct. 23	15	36	56	+ 2	7·0
25	—	42	58	+ 0	24·4
27	—	48	50	− 1	15·2
29	15	54	32	2	51·8
31	16	0	6	4	25·3
Nov. 2	—	5	31	5	55·8
4	—	10	48	7	23·3
6	—	16	0	8	48·0
8	—	21	8	10	9·9
10	—	26	10	11	29·0
12	—	31	8	12	45·5
14	16	36	2	−13	59·4

On November 8 the intensity of light has the same value as on the day of discovery, August 21.

GEOGRAPHICAL NOTES

TWO members of the Greenland Scientific Expedition, viz., Lieut. Jenson and M. Kornerup, arrived back at Copenhagen on October 13 in the Greenland trading ship *Ceres*, which sailed from the colony of Egedesminde September 4. Lieut. R. Hammer left Egedesminde at the same time for the colony of Jacobshavn to take up his winter station there, in order to fulfil the special duties intrusted to him. M. Steenstrup takes up his winter station in the Umanak district, and it is intended that Steenstrup and Hammer shall meet next year, so that they may prosecute their researches together.

MÉNILIK, King of Shoa, has written a letter to the president of the Geographical Society of Paris in reference to the scientific mission which has been sent to Shoa by the Geographical Society of Rome and which has the protection of his government. But the King would like better to have to assist a French mission sent to him by the Geographical Society of Paris; consequently he desires the Society to fit out an expedition, promising them to employ all his power on their behalf. He complains bitterly against the Egyptian Government, which prevents Abyssinia from being placed in communication with European civilisation as it had been in former centuries. The letter is written in French and sent with an Abyssinian translation.

THE Grand Duke Nicholas of Russia has ordered M. Barante to translate into French his work "On the Canalisation of the Amu-Daria" and present it to the Paris Geographical Society. The work will be published *in extenso* in the Transactions of the Society.

A TELEGRAM received by the Russian Geographical Society communicates the following particulars as to the scientific expedition now exploring Tibet, under the leadership of Col. Prshevalski. On May 1 it was on the river Boolagan, having marched nearly 600 versts from Saizan, through Booluntokhoi, up the river Yrungo. The Colonel intended crossing the southern Altai Mountains by the shortest way to Barkool. All his companions were in good health, and success had attended all their efforts. Another telegram to the Russian General Staff, dated May 30, states that Col. Prshevalski had then accomplished a third part of the distance between Saizan and the Himalayas, reaching the town of Khani, whence he intended going to Shadsheoo and Paidan. Another Russian geographical expedition, it will be remembered, in three sections, is at present prosecuting researches east of the Caspian, though the same success does not seem to crown its labours. A letter reaching St. Petersburg by way of Orenburg says that the scientific party sent out to explore the Amu Darya, or Oxus, was attacked by about 100 mounted Turcomans, who were, however, repulsed. The whole course of the Amu Darya, as well as of its affluents, is described as having been found navigable.

M. REVAEL, who spent a long time with the Somalis on the western coast of the Gulf of Aden, has described to the Geographical Society of Paris the land and its inhabitants, who appear to be very anxious to trade with Europeans, and he presented an Arab firman signed by the Sultan inviting foreigners to visit his dominions. M. Revael is to return to Somali land with Prince Albert of Monaco.

IN the belief that not much is generally known in England on the subject, Mr. Consul Gollan devotes a considerable part of his last official report to a description of the geographical position, climate, population, industries, &c., of the two provinces of Santa Catharina and San Pedro do Rio Grande do Sul, in Southern Brazil. The former lies between 26° and 29° 30′ S. lat., and 48° 30′ and 52° W. long.; it contains an area of about 14,700 square miles, with a population of almost 160,000. The latter province, usually known as Rio Grande do Sul, lies between 25° 30′ and 32° 30′ S. lat., and 49° 40′ and 58° 20′ W. long.; it has an area of 118,758 miles, with a population of 430,000. The climate, more especially of the latter province, is described as excellent, a term which does not apply to the upper portions of the empire. Being some 700 miles outside of the tropics, these provinces have the advantage of a temperate climate, and are consequently the best adapted to immigration.

A LLOYD'S telegram dated Kobe, October 17, reports the *Vega*, Swedish exploring steamer, arrived at that port on the 14th inst.

SERIOUS preparations for the construction of a railway into the interior of Africa are now being made in France.

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French engineers are investigating the territory from the starting-point of the future line to the Laghouat in the south. From that point as far as the line from Ain Sala au Khat military-technical expeditions are to prepare the way. Besides this the Oran Geographical Society and the Vice-Prefect of Tlemcen are to send caravans along the frontier of Marocco. MM. Soleillet and Duveyrier will travel on their own account for the same object.

A MEETING took place at Dortmund on the 4th inst., which had for its object the discussion of a project for connecting the Rhine and the Weser by means of a canal. The Government presidents of Westphalia, of the Rhineland, and of Hanover were present. The canal will be constructed *viâ* Ruhrort and Heinrichenburg, but it is undecided as yet whether from the latter place it will proceed to Emden or to Minden. Special committees were formed for the purpose of further investigating the latter question.

MESSRS. SCHMIDT AND GÜNTHER, of Leipzig, will shortly publish an elaborate work on India by Emil Schlagintweit. The work will appear in thirty-five parts, and will be profusely illustrated by eminent artists.

A PARLIAMENTARY caravan comprising about twenty members of the French Senate and Chamber of Deputies is travelling all over Algeria in order that the legislators may become acquainted with the peculiarities of the land and inhabitants. The tour will be terminated at the end of the month.

THE PLANETS OF THE SEASON

SELDOM could the aspect of the nocturnal sky be more attractive to the student of planetary phenomena; seldom has his inquiring gaze been repelled more pertinaciously by

"Vapours and clouds and storms,"

than during the past anomalous season; and our English climate has more than maintained its accustomed forbidding character, just when a few nights of transparency would have been especially welcome. Better things, however, may still be in store; and in that hope the following remarks on the distinctive features of the present ornaments of our midnight sky may be admissible as possibly of some suggestive value to comparatively inexperienced observers.

We have for some time past had a simultaneous presentation, under the favourable circumstances of proximity to the earth and a greatly improved altitude as compared with recent oppositions, of three peculiarly remarkable objects, the most magnificent, the most ornate, and—so to speak, the most earth-like member of the planetary family. Each holds his own pre-eminence on his own ground; each bespeaks especial study from his own individual character; and it is probable that some acquaintance with foregone results may economise time and labour by enabling us to leave on one side what is already, in comparison, sufficiently known.

The examination of Jupiter is not at present quite as satisfactory as it would be with as much north as he has south declination; it is always, however, greatly facilitated by the broad expanse of his noble disk, and a brilliancy so great as to have occasioned a suspicion of unborrowed light, emanating from internal incandescence. While, however, the shadows of the satellites upon his surface are so intensely black, and the satellites themselves so utterly invisible in eclipse, it is evident that any accession of luminosity from such a cause, even if it exists, must be quite insensible in the general effect, which can only be ascribed to an extraordinary reflective power in the whiter portions of the globe. A diminution of brightness towards the limb, which might be anticipated on optical grounds, and is frequently demonstrated by the reversal of the aspect of a passing satellite from light to dark, or the contrary, is nevertheless not distinguishable by the eye, nor even when a portion of the light has been intercepted by darkening glasses; it is, however, apparent if the screen is deep enough in tint to extinguish the satellites. This was scarcely to be expected. It might have been supposed that a central region so bright as to exhibit a white disk in front of it as dark, even to blackness, by contrast, could not escape being itself strongly contrasted with a border so much fainter that the same disk appears luminous on it as a background. Yet the difference is not obvious; and no other cause can be assigned excepting the imperceptible gradation. The idea of absorption in the upper region of an extensive atmosphere, not otherwise manifesting its existence, has indeed been entertained; but it seems unnecessary. The observed decrease of brilliancy is only what would result from obliquity of incidence in the solar rays, and it probably exists in no greater proportion than is due to that cause. The atmospheric hypothesis might indeed have been directly tested, by comparing the brightness of the satellites when near the limb in the superior and inferior portions of their orbits, had their light been sufficiently equable; but its variations are too evident and at the same time too irregular to render such comparisons satisfactory. A long course of observation might indeed eliminate these discrepancies, but it is questionable whether the result would repay the labour. Nevertheless the fact referred to, of the incompetence of, at least, ordinary vision to detect the diminution of light towards the limb is worth attention, as leading to inferences rather unfavourable to the sensitiveness of the eye in some of the processes of photometry. At a considerable distance from opposition, when the terminator encroaches slightly on the elliptical form of the limb, the defalcation of light on that side may be readily detected.

As to the real nature of that magnificent globe we are compelled to admit an embarrassing amount of ignorance. We see indeed that it is encompassed by an envelope, subject to occasional disturbances of a nature which on our earth would necessarily infer the extensive prevalence of vapour, sometimes in tranquil suspension, at others either agitated by rapid currents, or subject to equally speedy processes of precipitation and solution. Beyond this we can hardly be said to know anything. Jupiter is in no respect an enlarged resemblance of the earth. With so little similarity in point of density and gravitation—with so slight a diversity of seasons—with such rapid interchange of day and night—could we be transported there, we might probably find ourselves as among the imagery of an incomprehensible dream. Vapour we might recognise—and vapour occasionally in a state of rapid change; but possibly not the vapour of water; and whether exhibiting itself in the luminous or shady spaces could hardly be decided by a mere comparison with terrestrial clouds. These would no doubt be to a distant eye brighter than the surface beneath them, but among so much that is dissimilar a single point of analogy would hardly bear much weight; it is, however, the more probable alternative that the dark bands are the transparent part of the atmospheric envelope, from the fact that these become less distinct towards the limbs. The obliteration is not indeed always apparent, and is often absolutely imperceptible in a sharply defining instrument; but it has been frequently referred to, and if these ideas are correct, it may probably be found that in proportion to the darkness of the belts will be the nearness of their approach to the edge of the disk. The disappearance of dark spots near the limb would be accounted for by the rules of foreshortening in perspective.

The tendency to an equatorial arrangement in these streaks is one of the most familiar features of the planet; and almost self-evidently connects itself with the astonish-

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